3212

National **Technics**

FM/AM STEREO RECEIVER

SA-5760

OPERATING INSTRUCTIONS

Cabinet color differs according to area.

Before operating this set, please read these instructions completely.

321

Dear Stereo Fan

We want to thank you for selecting this product and to welcome you to the growing family of satisfied Technics product owners around the world. We feel certain you will get maximum enjoyment from this new addition to your home.
Please read these operating instructions carefully, and be sure to keep them handy for convenient reference.

MATSUSHITA ELECTRIC
Kadoma, Osaka, Japan

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HELPFUL HINTS

1. Keep this unit away from electrical noise-generating devices such as motors and fluorescent lamps.
2. The set should not be exposed to direct sunlight, and should be kept free from dust, moisture and vibration.
3. The set is ventilated through vents on the top and bottom of the cabinet. Do not place any object on the top, or place the set on a soft surface which might block the ventilation holes and result in too much internal heat. Place the receiver in a position away from any heat source.
4. The cabinet of your set should be given the same care which you would give any piece of fine furniture.
   The front panel should be cleaned with a soft cloth moistened with a mild soap-and-water solution.
   NEVER USE A SOLUTION CONTAINING BENZOL OR PETROLEUM.

STAR FEATURES

AMPLIFIER SECTION

■ Power amplifier circuitry features low distortion, high stability and large output

The power amplifier circuitry of this unit consists of a differential-amplifier stage, emitter-follower circuitry, a voltage-amplification stage, and a pure-complementary output stage...and features the direct-coupled OCL (Output-capacitorless) circuitry type of construction through all stages.
The primary stage—differential amplification—uses single-packaged dual transistors (which feature highly uniform temperature characteristics and high stability), and the Zener diodes are used to stabilize the operation of the common emitters.
Next, after the differential-amplifier primary stage, is the emitter-follower circuitry. This circuitry not only reduces the load of the differential-amplifier, but also reduces the impedance which drives the next stage—the voltage amplification stage—and thus greatly improves naked characteristics.
The voltage-amplification stage includes transistorized constant-current circuitry, as the load, and the disadvantages of the bootstrap method (decreased output power in the low range, etc.) are eliminated. In addition, the idling current of the transistors in the output stage is stabilized, and, in conjunction with appropriate temperature compensation, the occurence of distortion is drastically reduced at every power output level, from very low power to very high power.
The output stage consists of pure complementary circuitry (a combination of PNP and NPN transistors), and, thanks to the excellent circuitry design in preceeding stages, a tremendous power output of 165 watts per channel (from 20 Hz to 20 kHz, at 8 ohms) and an extremely low total harmonic distortion ratio of only 0.08% have been made possible.

■ High-performance equalizer circuitry with "current-mirror load"

The equalizer circuitry is three-stage, direct-coupled, dual-power-supply circuitry which includes a primary stage with "current-mirror-load" differential amplification, and an output stage in which pure-complementary SEPP circuitry is used.
The use of "current-mirror-load" differential amplification in the primary stage results in ideal distribution of the gain, and the use of low-noise transistors makes it possible to obtain a signal-to-noise ratio of 78 dB at an input sensitivity of 2.5mV,thus assuring the finest quality of disc reproduction.

In the negative-feedback elements, which determine the RIAA reproduction characteristics, metal-film resistors with a resistance deviation of less than 1%, and polypropylene capacitors with a capacitance deviation of less than 2%, are used...thus resulting in a precise fidelity which is within ± 0.2 dB of the ideal RIAA curve.
In addition, a constant-voltage power supply is used, thus reducing transient crosstalk and greatly improving dynamic characteristics.

■ Three-stage, direct-coupled tone-control circuitry with differential amplification for high stability

The tone-control circuitry includes 5 transistors and is three-stage, direct-coupled, dual-power-supply circuitry which includes a primary stage with a differential amplifier, and an output stage with pure-complementary circuitry. Its power supply is, of course, a constant-voltage, regulated power supply.
The result is variable characteristics which are extremely smooth, with high direct-current stability, and 2-step turnover frequencies for both the bass and the treble, thus making it possible to make very minute corrections of the frequency response.

■ Power-supply circuitry which eliminates mutual interference between left and right channels

The more output power that an amplifier has, the more important it is that the power-supply circuitry be perfect and complete in every respect. And, even though the signal strength in the tuner and the preamplifier may be small, the unit cannot operate at its highest performance levels unless the power supply is stabilized.
The power supplies for the tuner and the preamplifier of this unit are all constant-voltage, regulated power supplies, and the power-supply circuitry of the output stage of the power amplifier uses large-capacity 22,000-μF electrolytic capacitors as smoothing capacitors, completely separated from and independent of the power-supply circuitry of the primary stage. The differential amplification stage and the voltage amplification stage of the power amplifier are, of course, driven by a constant-voltage, regulated power supply.
The result of this construction is the elimination of mutual interference between channels, as well as operation performance which is always stable, thanks to a great reduction in the amount of influence upon the unit's operation caused by fluctuations of the power-supply voltage.

■ Special circuitry design for complete protection of the unit

- Protection circuitry which operates under conditions of abnormal load (impedance of 2 ohms or less, a short-circuit in the load, etc.)
  By using special bridge-type protection circuitry, current limiters instantly function when the load is abnormal during operation, thus protecting the circuitry of the power amplifier and at the same time causing the overload indicator to illuminate in order to warn of the abnormality.
- Automatic relays operate to protect speakers in the event that any abnormality occurs within this unit.
- Special output timing circuitry suppresses "popping" (shock) noises which might occur when the power is turned on or off.

FM TUNER SECTION

■ FM "front end" with superb high-input-power characteristics and interference-elimination characteristics

The circuitry design of the FM "front-end" was especially planned to emphasize high-input-power characteristics and interference-elimination characteristics. The level of interference has been greatly improved (to – 50 dB) thanks to the adoption of buffer circuitry which uses an FET in the local oscillation section. In addition, printed patterns have been removed from important parts of the local oscillation section and replaced by "floating" wiring, thus resulting in excellent local oscillation, with frequency drift which has been extremely reduced.
The highly reliable frequency-linear 4-gang variable capacitor features, of course, very high electrical precision, and is especially resistant to temperature changes and ageing changes. This ability to eliminate interference is furthermore increased by the use of high-performance, low-noise, dual-gate MOS FETs in the RF-amplification stage and in the mixer stage.

■ FM-IF section with emphasis upon waveform fidelity

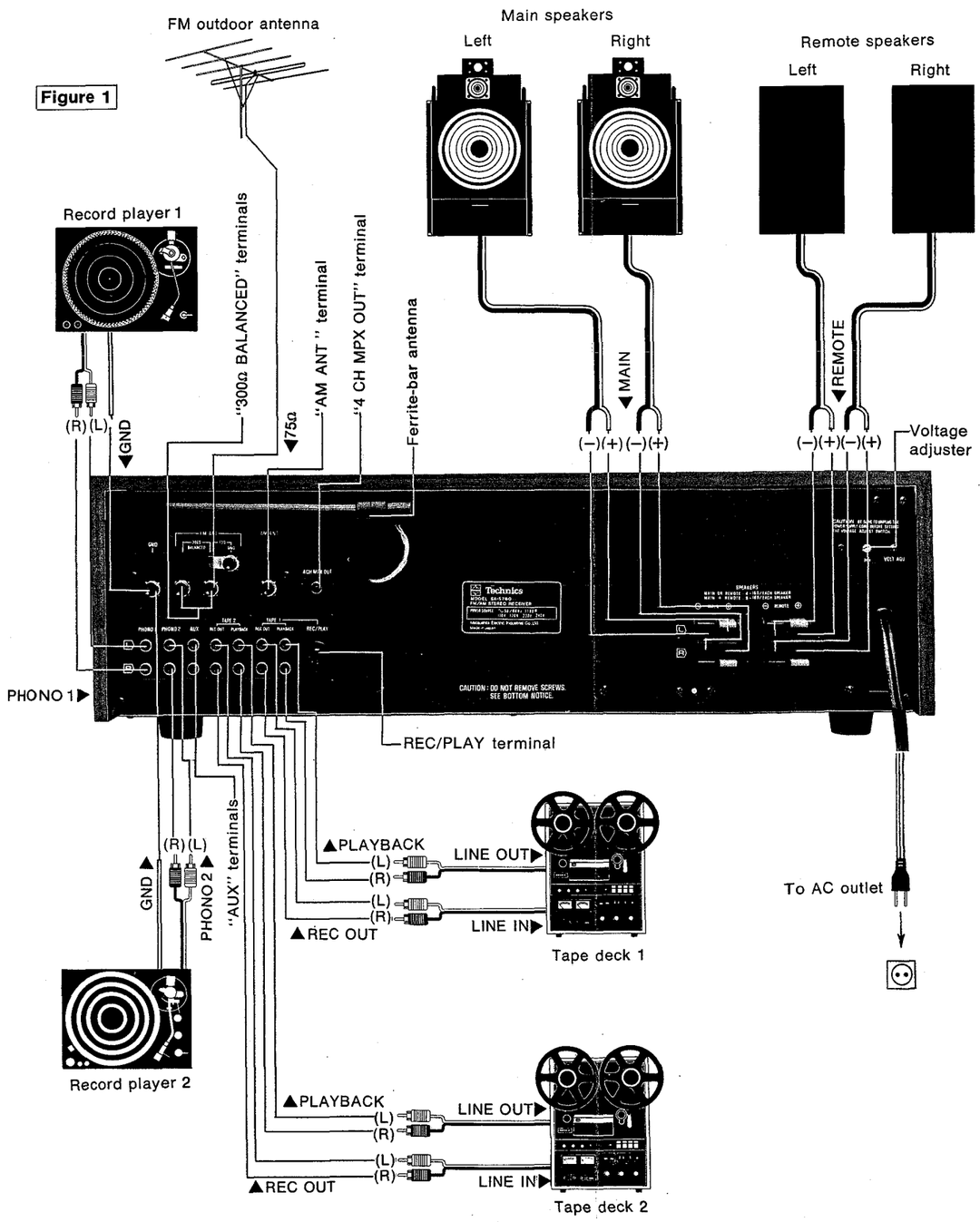
The IF-amplification section is divided into two independent parts: one for the signal and one for IF control. Of these, the signal system has in particular been designed as highly-advanced circuitry with plenty of surplus capacity and so as not to be affected by the IF control system.
The signal system is circuitry designed in order to place special importance upon the fidelity of the waveform. Newly developed ceramic filters are used both for superior group-delay characteristics and for superior band characteristics. And, in order to obtain perfect amplitude characteristics, the circuitry is designed as six-stage all-stage differential amplification circuitry, thus resulting in a selectivity of 80 dB, a signal-to-noise ratio of 85 dB, and with various other characteristics which have been greatly improved both for monaural and stereo operation.
The IF-control system is composed of three-stage amplification circuitry in which special narrow-band two-element ceramic filters are used. This construction results not only in a high level of output from the linear field-strength indication meter, but also avoids adverse influences upon the signal system.
There is, in addition, special muting circuitry, separate from the transmission system, which uses a lead relay to perform muting.

■ Multiplex section with PLL system for excellent mutual-delay characteristics

The multiplex section includes high-performance PLL integrated circuitry for better separation and lower distortion. The oscillation circuitry has special humidity-proof capacitors enclosed in a metal case, thus resulting in outstanding environmental and ageing characteristics.
Thanks to the use of superb Chebyshev low-pass filters, with a mutual delay at 15 kHz of only 5.5 μS, the frequency response is extremely flat: +0.2 dB~ −0.8 dB from 20 Hz to 15 kHz.
Finally, in order to reproduce a signal which is even purer and more faithful to the original, this unit employs a unique system in which the low-pass filter can be switched out of the circuit (at the "CONST" position of the delay time switch) in order to obtain a remarkable frequency response of +0.2 dB~−0.8 dB from 20 Hz all the way up to 18 kHz.

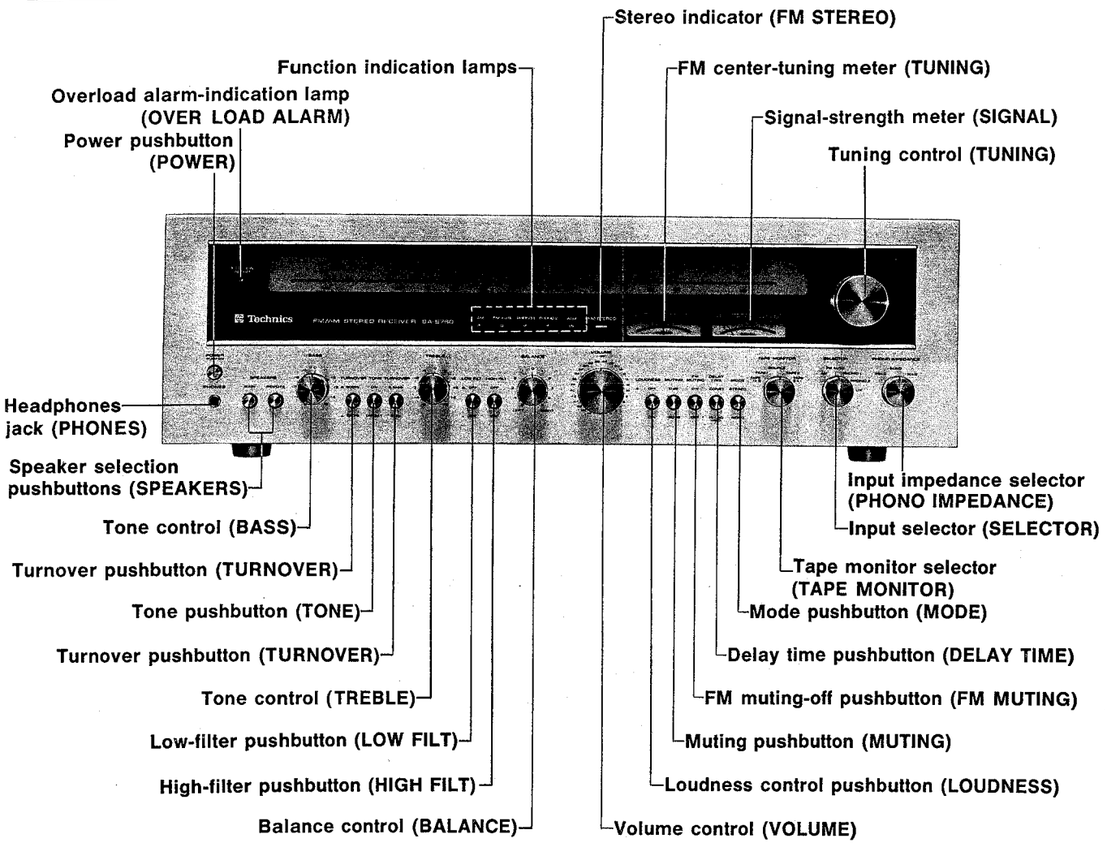
CONNECTION WIRING FOR A STEREO SYSTEM

Figure 1



CONTROLS AND THEIR FUNCTIONS

Figure 2



Power pushbutton (POWER)

Upon pushing this button, the tuning dial, the signal-strength meter and the FM center-tuning meter will illuminate, indicating that the receiver is on.
To turn the receiver off, push the button again; the lights of the tuning dial, signal-strength meter and the FM center-tuning meter will go off.
This pushbutton also controls the power to the "switched" outlet on the rear panel of the receiver.

Speaker selection pushbuttons (SPEAKERS)

Pushbutton speaker selection system.
The speakers are selected by pushing one or both buttons, and are turned off by repushing. Only the speaker system which is switched on operates.
It is possible to operate both speaker systems by pushing both buttons.
In addition, sound reproduction can be enjoyed by using only the headphones, even when both speakers systems are switched off.

Input selector (SELECTOR)

For selection of the input sound source.
PHONO 1. 2: For record player operation.
FM AUTO: Use this position to listen to radio programs on the FM broadcast band. Many of the broadcasts on this band may be stereophonic.
The "FM AUTO" position automatically provides stereo/mono switching for stereo or monaural broadcasting.
AM: Use this position ot listen to radio programs on the AM broadcast band.
AUX: For playback of the sounds from equipment connected to the auxiliary input terminals.

NOTE:
If the input levels of each program source are not matched and the input selector is inadvertently switched, a large sound output may be applied to the speakers, causing damage to them.
To avoid this, make sure, when switching inputs, either that the input levels are matched, or that the volume is reduced before switching.

Function indication lamps

One of these indication lamps automatically illuminates to indicate which program source has been selected by the input selector.
If, for example, the input selector is set to the "FM AUTO" position, the indication lamp marked "FM AUTO" illuminates. If the input selector is set to the "PHONO 1" position, likewise the indication lamp marked "PHONO 1" illuminates.

Tape-monitor selector (TAPE MONITOR)

TAPE 1: For playback from the tape deck connected to the tape 1 terminals.
TAPE 2: For playback from the tape deck connected to the tape 2 terminals.
SOURCE: For reproduction of the sound from the sound sources selected by the input selector.
TAPE 1▶2: For recording (dubbing) from tape deck 1 to tape deck 2.
TAPE 2▶1: For recording (dubbing) from tape deck 2 to tape deck 1.

Tuning control (TUNING)

Turn the tuning control slowly until the dial indicator indicates the desired FM or AM broadcast frequency. Always tune for the highest possible signal-strength meter reading, which indicates the optimum receiving position. This will assure clear, undistorted reception, minimum interference from adjacent stations, and maximum left-right channel separation during FM stereo broadcasts. The value of the signal-strength meter reading will depend on the signal-strength of that particular station.
When the FM center-tuning meter needle is at the center, reception is optimum. Turn the tuning control slowly to left and right until the FM center-tuning meter needle points to the center position.

Signal-strength meter (SIGNAL)

Tune the receiver to the approximate frequency of the desired station.
Observing the signal-strength meter, tune until its indicator moves to the maximum position, which indicates the position of best tuning.

FM center-tuning meter (TUNING)

For FM broadcasts, tune approximately by referring to the signal-strength meter. Pinpoint the best, least distorted position with the FM center-tuning meter.
The needle of the meter is in the center if no broadcast is being received. During tuning, the needle fluctuates to the left and right. When the station is locked in, the needle returns to the center. If the tuning control is re-adjusted, the needle will fluctuate again to the left and right, and when the broadcast is completely detuned, the needle returns to the center.

Stereo indicator (FM STEREO)

The stereo indicator illuminates in orange when the receiver is tuned to a station broadcasting in FM multiplex stereo.
If the mode pushbutton is pressed to the "MONO" position, the stereo indicator will not illuminate even though the broadcast is in stereo.

Mode pushbutton (MODE)

The mode pushbutton is used to select the playback mode of the program source.
This pushbutton has two positions, "STEREO" (released) and "MONO" (pressed).
STEREO: For reproduction in stereo.
The left input is reproduced from the left speaker, and the right input is reproduced from the right speaker.
MONO: Mixed inputs of both left and right are reproduced from both speakers as monaural sound.

Volume control (VOLUME)

This control is for adjustment of the volume level.
The volume level is increased by turning the control to the right, and decreased by turning it to the left.
The control is graduated, between 0 dB and −40 dB, in 2-dB steps, for volume attenuation. For reproduction at a level lower than −40 dB, it is convenient to set the muting pushbutton to the "−20 dB" position. Note, however, that the volume will be suddenly increased if the muting pushbutton is released to the "0 dB" position during operation.

Muting pushbutton (MUTING)

If this pushbutton is pressed to the "−20dB" position, the volume is decreased by 20 dB without changing the setting of the volume control.
This pushbutton is convenient for use when changing a disc, or for decreasing the volume because of, for instance, the arrival of an unexpected caller or a telephone call.

Balance control (BALANCE)

The left and right volume balance is influenced by the difference, if any, between the efficiency of the left and right speakers, and by the placement of the furniture in the listening room.
In addition, the left and right volume of some program sources is not well balanced. If the control is turned further to the left, beyond the "0" position, the right sound becomes lower. At the "LEFT" position (at which the control is comly turned to the left), the right sound cannot be heard at all, and only the left sound is emitted.
If the control is turned to the right, the left sound becomes lower and, at the "RIGHT" position (at which it is completely turned to the right), the left sound cannot be heard at all, and only the right sound is emitted.
In order to adjust the balance between the left and right volumes, push the mode pushbutton to the "MONO" position, so that the sound is heard from a position at the center between the left and right speakers.
After the balance is satisfactorily adjusted, push the mode pushbutton once again to release it outward to the "STEREO" position.

Tone controls (BASS, TREBLE)

These controls are used to make adjustments of the tone quality which may become necessary as a result of speaker characteristics or listening room characteristics, making it possible to adjust the tonal quality to that most agreeable to the listener's preference.
The bass control is for adjustment of the tone quality of the low sound range, and the treble control is for the high sound range. The characteristics can be changed within a range of +12 dB to −12 dB for the bass at 50 Hz, and within a range of +10 dB to −10 dB for the treble at 10 kHz.

The characteristics are "flat" at the "0" position, and are increased by turning the control to the right from the "0" position, or decreased by turning it to the left.

Turnover pushbutton (TURNOVER "250 Hz","500 Hz")

This pushbutton can be used to change the characteristic variable range of the bass control. It is used to expand the variable range of the bass sound by 250 Hz or 500 Hz. If this pushbutton is pressed to the "250 Hz" position, only the deep bass sound range characteristic can be varied, leaving the mid-range sound range characteristic unchanged. If the bass range is unsatisfactory because, for instance, bookshelf type speakers are used, press this pushbutton to the "250 Hz" position and increase the setting of the bass control in order to better reproduce deep bass sounds.

Turnover pushbutton (TURNOVER "2.5 kHz","5 kHz")

This pushbutton can be used to change the characteristic variable range of the treble control. It is used to expand the variable range of the treble sound by 5 kHz or 2.5 kHz. If this pushbutton is pressed to the "5 kHz" position, the ultra-high sound range characteristic can be varied without changing the mid-range characteristic.
Because this treble range corresponds to the reproduction range of the super tweeter as well as to the range where a tone difference of an MM-type cartridge occurs, is it useful for adjustment of delicate shades of sounds.

Tone pushbutton (TONE)

When this pushbutton is pressed to the "DEFEAT" position, the characteristics of both tone controls (bass and treble) become flat at any position to which they are set.

Low-filter pushbutton (LOW FILT)

If this pushbutton is pressed to the "ON" position, bass sound which is lower than 30 Hz is decreased with a sharp curve characteristic of −12 dB/oct.
This pushbutton is especially useful when there is unwanted noise in the low range because of record warp, motor rumble, poor performance by the cone of the woofer, etc.

High-filter pushbutton (HIGH FILT)

If this pushbutton is pressed to the "ON" position, treble sound which is higher than 7 kHz is decreased with a sharp curve characteristic of −12 dB/oct.
This pushbutton is especially useful if there is a great amount of record "scratch" noise, tape hiss, or if the tone quality is unsatisfactory because there is much distortion in the treble sound of the program source.

Loudness control pushbutton (LOUDNESS)

The loudness control compensates for "thinning out" of the sound. Human ears cannot perceive the low-frequency range at low volumes, but this control compensates for this, boosting the bass as the volume decreases. Note, however, that if the volume control is set to a position higher than the "−24 dB" indication (with the muting pushbutton at "0 dB"), the efficiency becomes less.

FM muting-off pushbutton (FM MUTING)

This muting-off pushbutton should be kept in its normal position (released, muting-on position) to eliminate annoying between-station noise or extremely weak stations on the FM band. Because weak-signal stations are difficult to tune, nearly impossible to listen to in stereo, and will not possess the noise-free reception characteristics of strong-signal stations, it is recommended that you keep the muting-off pushbutton at the normal (released) position.
Should you wish to search for or listen to weak-signal stations, press the pushbutton (muting off).

Delay time pushbutton (DELAY TIME)

This pushbutton is used only when an FM stereo broadcast is tape recorded.
It should usually be set to the "CONST" position. If, however, the FM stereo broadcast is tape recorded on a tape deck which has a low bias frequency, the FM stereo signal's pilot carrier signals of 19 kHz, 38 kHz, etc. will interfere with the bias frequency of the tape deck and may result in a "beat" signal which will distort the signal being recorded. If, therefore, the tape deck has a low bias frequency, push this pushbutton to the "HI-LAG" position. When this pushbutton is set to the "HI-LAG" position, the pilot carrier signal of the FM stereo broadcast signal will be eliminated, thereby preventing the occurence of the "beat" signal described above.
Note that this pushbutton should be set to the "CONST" position when listening to an FM stereo broadcast or when an FM stereo broadcast is being tape recorded on a tape deck which was designed with a recording bias which will not result in this "beat" interference, because the frequency response remains flat all the way to the higher frequencies, and sound will be closer to the original sound, when this pushbutton is set to the "CONST" position.

Input impedance selector (PHONO IMPEDANCE)

For selection of the input impedance of the PHONO 1 and PHONO 2 terminals: 25k, 50k, 100kΩ.

Overload alarm-indication lamp (OVER LOAD ALARM)

This indication lamp illuminates to indicate that the protection circuitry of this unit is functioning when the speaker connection wires are short-circuited, or when 4 speakers of four-ohm impedance are used at the same time, or when connections to speaker systems are incorrect or incomplete, etc.
If this indication lamp illuminates, the power to this unit should be turned off immediately. Do not turn on the power again until the cause of the trouble has been determined and corrected.

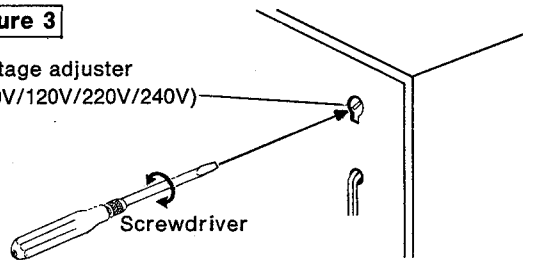
CONNECTIONS AND OPERATION

Do not plug the receiver into a power outlet until all other connections have been made. Keep the power pushbutton to the "OFF" (released) position.

VOLTAGE ADJUSTMENT

This unit includes a voltage adjuster which permits the unit to be used on AC 110V, 120V, 220V or 240V.
The voltage to which is has been pre-set is shown on the label attached to the power plug.
If your local voltage is different, set the voltage adjuster to your correct local voltage.
Be sure to set the voltage adjuster to the proper voltage before connecting the AC power plug.

Figure 3



SPEAKER CONNECTIONS AND OPERATION

This unit has two pairs of speaker terminals, marked "MAIN" and "REMOTE," making connection of two speaker systems possible. Selection of the speaker system to be used is made by pushing one, or both, of the speaker selection pushbuttons on the front panel, thereby activating either the main or remote speaker system, or both speaker systems at the same time.

■ Impedance of speakers

Use speakers with a voice coil impedance of 4~16Ω with this unit.
If, however, the main and the remote speaker systems are both used at the same time, speakers of 4-ohm impedance cannot be used. Use speakers with an impedance of 8~16Ω.

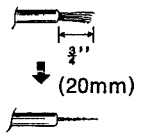
■ Speaker connection wire

Use medium gauge wire, such as AC power cord, for speaker connections so as not to decrease the damping factor.

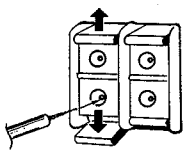
■ Connections

For perfect connections, follow the procedure shown in figure 1 and figure 4. Note that the upper terminals are for the left channel, and the lower terminals are for the right channel; the brown terminals are ⊕ and the black terminals are ⊖.

Figure 4



1 Strip off about 3/4 inch (20mm) of the connection cord insulation and twist the strands together.



2 As shown in the illustration, push the lever of the speaker terminal, and insert the core of the wire completely into the hole until it is no longer visible. Then release the lever.
Be sure, however, not to insert the covered part of the wire into the hole.

■ Speaker placement

In general, it is advisable to place the speakers on a hard wall surface. Soft surfaces can often ruin the deep tones of the bass.
Also avoid placing the speakers facing a solid surface because an echo effect may result and distort the quality of the reproduced sound.
In summary, place the speakers on a very hard surface, and, if a hard surface such as a window or panels faces the speakers, cover it with soft material such as curtains.

■ Polarity (⊕ and ⊖) check

After the connections of the speaker systems have been completed, confirm that the polarity of the speaker connections to the speaker terminals is correct.
How to check
Press the mode pushbutton to the "MONO" position. If the polarity is correct, the sound will seem to be heard from the center, between the left and right speakers.
If it is incorrect, the sounds will not appear to gather at the center, but will seem dispersed. If so, confirm that the connections of the speakers are correctly made. In order to correct the polarity, if it is incorrect, reverse the polarity connection between the amplifier and either the right or the left speaker.

NOTE:
Be extremely careful that the terminals or speaker wires do not "short" each other out. Never use the minus speaker terminal for ground connections.

CONNECTION AND USE OF AN FM ANTENNA

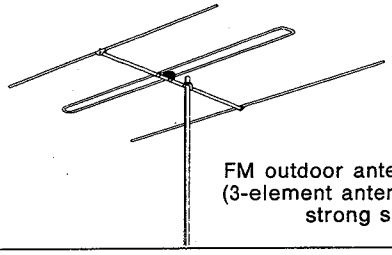
To assure finest reception quality of FM broadcasts, it is necessary to use an antenna which is appropriate to the reception conditions in your area. Select the optimum antenna after referring to the information given below.

■ A place near the broadcasting station where signals are strong (within sight of the broadcasting station transmission antenna)

If this unit is used in a place which is near the broadcasting station and the signals are quite powerful enough, or in a place such as the outskirts of a city where interference noise is relatively slight, the feeder antenna which is included with this unit may be used to obtain a certain degree of reception, although, in order to obtain the best reception of which this unit is capable, it is recommended

that a special outside antenna exclusively for reception of FM broadcasts, consisting of 3 to 5 elements, should be installed.

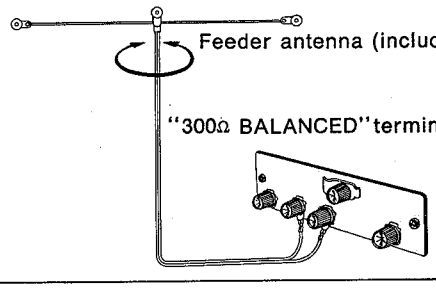
Figure 5



■ Feeder antenna

The feeder antenna which is included with this unit is provided so that you can use it to receive FM broadcasts temporarily until a special antenna exclusively for reception of FM broadcasts can be installed.
As shown in the illustration, connect this feeder antenna to the connection terminals of this unit marked "300Ω BALANCED" and, with both horizontal ends extended as shown, rotate the feeder antenna to the left and right and up and down while listening to an FM broadcast in order to determine the position of best reception. When this position has been determined, install the feeder antenna so that it remains in that position.

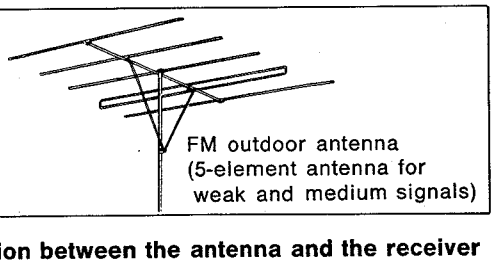
Figure 6



■ A place far from the broadcasting station where signals are weak and reception is difficult (such as near mountains or similar obstacles)

In such a location as described above, an FM antenna consisting of 5 elements or more should be installed. In general, the more elements which the antenna has, the better will be its directional characteristics. It is suggested, therefore, that the weaker the signal reception in your area, the more elements the antenna should have in order to obtain good reception.

Figure 7



■ Connection between the antenna and the receiver

The connection wire which is used between the antenna and the antenna input terminals of the receiver is usually a 300-ohm parallel feeder wire or a 75-ohm coaxial cable. In comparison to feeder wire, a coaxial cable is more resistant to external interference, and also prevents fluctuations of the signal level which might be caused by environmental weather conditions.
In order to obtain the finest performance from this unit, it is recommended that coaxial cable be used rather than feeder wire. Use coaxial cable of the type 5C-2V or 3C-2V.

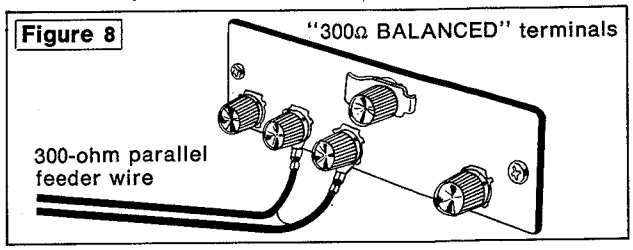
■ Connection to the FM antenna terminals of this unit

This unit includes two pairs of FM antenna input terminals: one pair of the 300-ohm type and one pair of the 75-ohm type. For this reason, connections can be made by using either a 300-ohm parallel feeder wire or a 75-ohm coaxial cable.

● If connections are made to the "300Ω BALANCED" terminals

Connections can be made, as shown in figure 7, by using 300-ohm parallel feeder wire. When this connection is made, the wire between this unit and the antenna should be as short as possible.

Figure 8

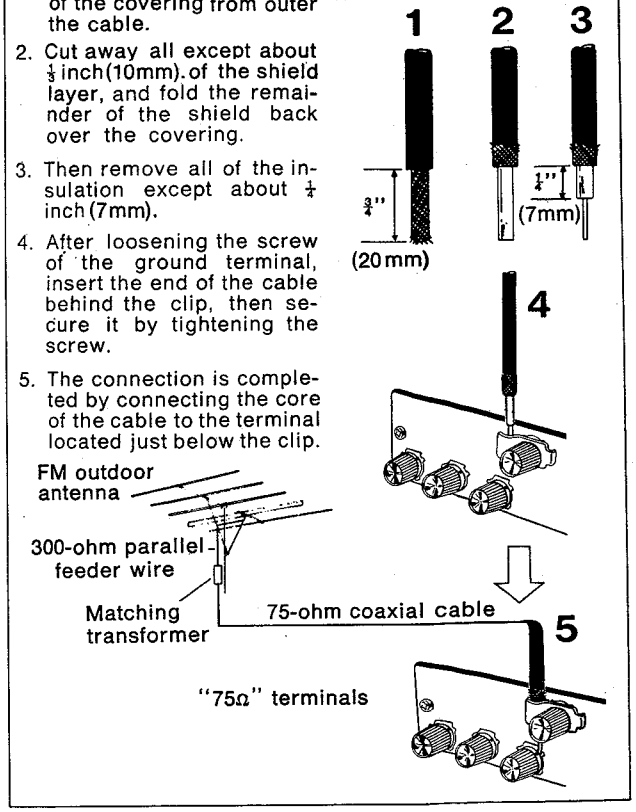


● If connections are made to the "75Ω" terminals

These connections should be made by using 75-ohm coaxial cable from the "75Ω" terminals of this unit, and by using a matching transformer between the antenna and this unit in order to match the impedance of the antenna to that of this unit.
A 300-ohm parallel feeder wire should be used to connect the matching transformer to the antenna, and the 75-ohm coaxial cable should be used to connect the matching transformer to the receiver. The matching transformer should be installed as near to the antenna as possible.

1. Strip about ¾ inch(20mm) of the covering from outer the cable.
2. Cut away all except about ⅓ inch(10mm) of the shield layer, and fold the remainder of the shield back over the covering.
3. Then remove all of the insulation except about ¼ inch(7mm).
4. After loosening the screw of the ground terminal, insert the end of the cable behind the clip, then secure it by tightening the screw.
5. The connection is completed by connecting the core of the cable to the terminal located just below the clip.

Figure 9



Note, however, that most multi-element FM antennas which have 5 elements or more include a built-in matching transformer and, therefore, the 75-ohm coaxial cable can be connected directly to the antenna.

■ Installation of an antenna exclusively for FM broadcasts

The location of the exclusive antenna for FM broadcasts is a very important factor in the determination of tone quality, and even the best antenna will not perform satisfactorily if it is installed in a poor location.
Carefully consider, therefore, the following information before deciding upon the location of the antenna.

1. It should be located in a place which is in the direct path of the FM broadcast signals, and not where the signals will be obstructed by buildings or other obstacles.
2. In order to be free of ignition noise interference from automobiles, etc., it should be located as high above the ground as possible, and should be as far as possible from neon and other electric signs.
3. It should be installed 6 feet(2m) or more from a metal roof, a concrete building, or from any other antennas, such as for television.
4. FM antennas have a high directional characteristic. In other words, they are much more sensitive to FM signals from one certain direction more than any other direction. The antenna should, therefore, be located so as to face in the direction of best reception.
5. It is usually true that the higher the antenna the better, although, depending upon the place, it may be that a lesser height would be more advantageous. Unless there are special conditions, therefore, a height of 12 feet (4m) or more above the ground is suggested.

■ FM broadcast reception

1. Keeping the volume control at the "-∞" position, press the power pushbutton to the "ON" position.
2. Set the input selector to the "FM AUTO" position.
3. Set the tape-monitor selector to the "SOURCE" position.
4. Release the mode pushbutton to the "STEREO" position.
5. Tune the receiver to the desired FM signal.
   After roughly locating the desired FM station with the signal-strength meter, pinpoint the position of least distortion with the FM center-tuning meter.
   The stereo indicator illuminates whenever the receiver is tuned to a stereo broadcast.
6. After pinpointing the desired station, increase the volume to the most comfortable listening level.
7. Make other adjustments in accordance with your taste and the acoustics of the room.

CONNECTION AND USE OF AN AM ANTENNA

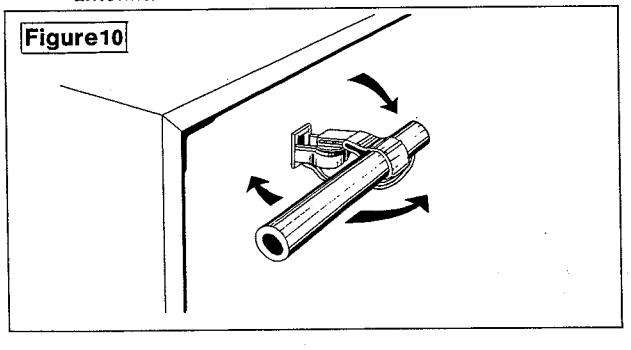
This unit includes a highly sensitive ferrite-bar antenna for reception of AM broadcasts and, therefore, there should be no necessity for connection of an outside antenna except in an area where signals are especially weak.

■ Ferrite-bar antenna

While listening to an AM broadcast, move the ferrite-bar antenna away from the surface of the rear panel and secure it in the position where reception is best.

Note: If the AC power cord or speaker wires are near the ferrite-bar antenna, interference noise may be heard. Never lift or carry this unit by using the ferrite-bar antenna as a handle.

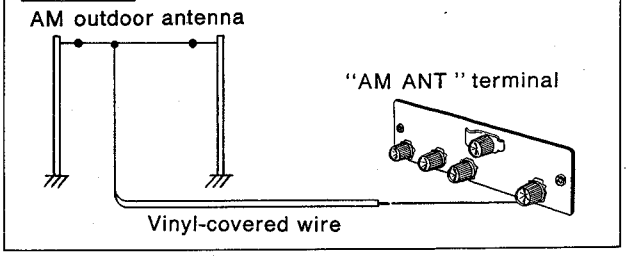
Figure10



■ AM outdoor antenna

In weak signal areas, far from broadcasting stations, or in a reinforced-concrete building, the highly-sensitive built-in ferrite-bar antenna alone may fail to provide good AM reception. If so, connect a length of vinyl-covered wire to the AM antenna terminal (labeled "AM ANT," on the rear panel).
Then place this antenna outdoors a short distance away from the building. Because the sensitivity of an outdoor antenna varies greatly with its position, someone should listen for the strongest signals as the antenna is oriented. For safety reasons, the antenna should include a lightning arrester.

Figure 11



■ AM broadcast reception

1. Set the input selector to the "AM" position.
2. Set the tape-monitor selector to the "SOURCE" position.
3. Set the mode pushbutton to either the "MONO" or "STEREO" position.
4. Tune the receiver to the desired AM signal.
   When the best tuning has been located, the needle of the signal-strength meter will be farthest to the right.
5. After tuning to the desired station, increase the volume to the most comfortable listening level.
6. Make other adjustments in accordance with your taste and the acoustics of the room.

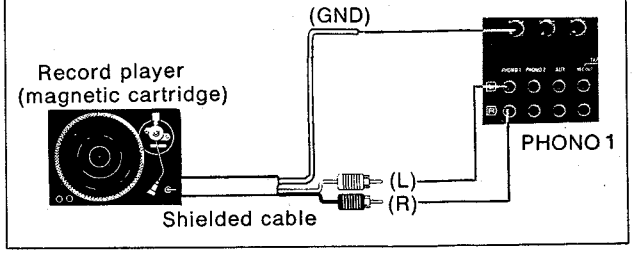
RECORD PLAYER CONNECTIONS AND OPERATION

This unit includes two sets of phono terminals, therefore making comparative listening of two record players and cartridges convenient, as well as making it possible to install and use different cartridges on different record players for use according to the type of music.

■ Connections

Connect the record player to the "PHONO 1" or "PHONO 2" terminals, being careful to connect the left and right connection wires correctly.
If the record player has a ground wire, connect it to the ground (GND) terminal. ("Short" pins will be found in the phono 2 terminals. When using the phono 2 terminals, be sure to remove these "short" pins. Do not insert them into any other terminals.)

Figure 12



■ Cartridge

Use a magnetic cartridge [moving-magnet type (MM), induced-magnet type (IM), or high-output moving-coil type (MC)] with an output of 2mV~10mV (50mm/sec).
If a low-output moving-coil type is used, it cannot be connected directly to the "PHONO 1" or "PHONO 2" terminals; a booster transformer or head-amplifier must be used.

■ Input impedance

The input impedance of the "PHONO 1" and "PHONO 2" terminals can be changed to 25kΩ, 50kΩ and 100kΩ by using the input impedance selector.
After first reading the operating instructions of the cartridge to be used, set the impedance to the value which is closest to the specified impedance.
If the input impedance is higher than the specified load impedance of the cartridge, the treble range will become higher, and, if lower, the treble range will become lower. Thus you can enjoy various tone qualities with one cartridge. Most cartridges can be used at an input impedance of 50kΩ.

■ Disc performance

1. Set the input selector to the position corresponding to the record player to be heard ("PHONO 1" or "PHONO 2").
2. Set the tape-monitor selector to the "SOURCE" position.
3. Release the mode pushbutton to the "STEREO" position.
4. Switch the turntable on and select the proper playing speed.
5. Place the tone arm on the record and increase the volume gradually to the most comfortable listening level.
6. Make other adjustments in accordance with your taste and the acoustics of the room.

CONNECTIONS TO THE AUXILIARY INPUT TERMINALS AND OPERATION

These terminals are for connection with the output terminals of a tape deck or 8-track stereo, a semiconductor cartridge with head amplifier, etc.

■ Reproduction

1. Set the input selector to the "AUX" position.
2. Set the tape-monitor selector to the "SOURCE" position.
3. Release the mode pushbutton to the "STEREO" position.
4. Sound will be heard by operating the sound source and turning the volume control clockwise.

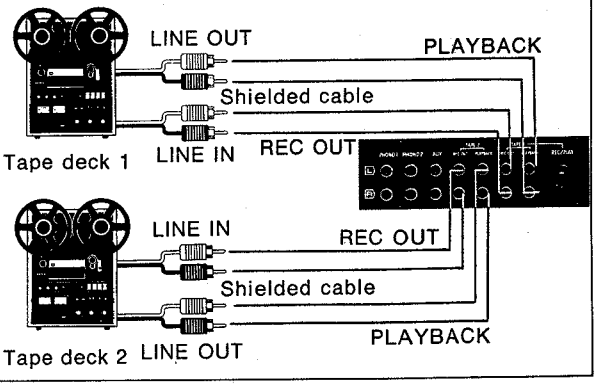
TAPE DECK CONNECTIONS, RECORDING AND PLAYBACK

You can connect 2 separate tape decks directly to this unit. The electronic characteristics of both tape deck terminals (1 and 2) are identical. Not only can this unit be used for recording to two tape decks at the same time, but tape "dubbing" (recording from one tape deck to another) is also possible.

■ Connections

Connect the playback terminals of this unit with the output terminals ("LINE OUT") of the tape deck.
Connect the recording output terminals of this unit with the input terminals ("LINE IN") of the tape deck.

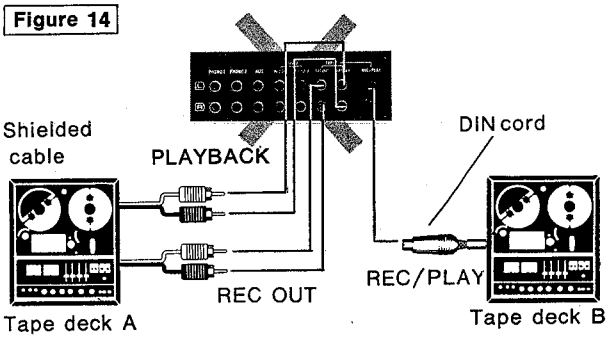
Figure 13



■ Recording/playback terminal

This is called the DIN connector,and is a terminal combining the functions of playback and recording. Recording and playback are possible by simply connecting one DIN cord.
Caution:
Do not connect a tape deck to the DIN terminal and to the pin-type terminals for tape deck 1 at the same time.
Connect to only one or the other.

Figure 14



Do not connect to the pin terminals and the DIN terminal at the same time.

■ Playback from a tape deck

1. Select the tape deck with the tape-monitor selector. (The input selector has no effect in any position.)
   For playback from tape deck 1, set the tape-monitor selector to the "TAPE 1" position.
   For playback from tape deck 2, set the tape-monitor selector to the "TAPE 2" position.
2. Release the mode pushbutton to the "STEREO" position.
3. After preparing the tape deck for playback, increase the volume gradually to the most comfortable listening level.
4. Make other adjustments in accordance with your taste and the acoustics of the room.

■ Recording with a tape deck

When the tape-monitor selector is in the "SOURCE," "TAPE 1" or "TAPE 2" position, the signal which has been selected with the input selector is constantly supplied, as a signal for recording, from the tape deck 1 and tape deck 2 recording output terminals.
In this instance, all operating controls, such as the volume

control and the tone controls, have no effect upon the recording.

1. Set the input selector according to the program source which is to be recorded ("FM AUTO," "AM," "PHONO 1," "PHONO 2," "AUX").
2. Prepare the tape deck for recording.
   The program which has been selected with the input selector is then recorded onto the tape.
3. Be sure to adjust the recording level of the tape deck.
4. Recording check
   The recording condition can be checked by using the tape-monitor selector. The sound prior to recording can be heard from the speakers by setting the tape-monitor selector to the "SOURCE" position, and the sound which has just been recorded can be heard from the speakers by setting it to the appropriate ("TAPE 1" or "TAPE 2") position.

■ Tape "dubbing"

Tape-to-tape recording ("dubbing") from tape deck 1 to tape deck 2, and from tape deck 2 to tape deck 1, is possible with this unit.
The direction of the dubbing (from tape deck 1 to 2, or from tape deck 2 to 1) is selected by using the tape-monitor selector.
If this selector is set to the "TAPE 1▶2" position, tape dubbing from tape deck 1 to 2 is possible; if it is set to the "TAPE 2▶1" position, tape dubbing from tape deck 2 to 1 is possible.
If this selector is set to the "TAPE 1▶2" position, the sound from tape deck 1 will be heard; if it is set to the "TAPE 2▶1" position, the sound from tape deck 2 will be heard.

CONNECTION AND USE OF HEADPHONES

■ Connection

Connect the headphones to the headphones jack at the left of the front panel. Use headphones with a voice-coil impedance of 4 to 16 ohms.

■ Operation

A signal is constantly supplied to the headphones jack regardless of the on/off setting of the speaker selection pushbuttons. When listening only by headphones, set the speaker selection pushbuttons to the "OFF" position.

DECODER CONNECTION TERMINAL (4 CH MPX OUT)

This is a signal output terminal for the discrete four-channel FM broadcasts which are expected in the future. To enjoy discrete four-channel FM broadcasts, one more pair of speakers, a pre-main amplifier and a decoder for discrete four-channel broadcasts are necessary, in addition to the ordinary stereo system.

GROUND TERMINAL

This terminal is connected with the ground wire of the record player, tuner and tape decks. When grounding, use vinyl-covered wire and add a copper strap to the end of the wire, which should either be buried or connected to a water pipe for efficient grounding.
Absolutely never attempt to connect this wire to a gas pipe.

OPERATION CAUTIONS

■ Connection wires

Wires used to connect this unit to other stereo equipment, such as a record player or a tape deck, should be high-quality shielded wire with low electrostatic capacity, and should, moreover, be thick wire and no longer than necessary. Use of this type of wire will minimize the incidence of induction of unwanted noise or hum, and will avoid loss of high-frequency characteristics. Especially note that, the longer the wire, the larger the decrease of high-frequency characteristics. Be sure that the wire is no longer than necessary for best results.

■ Connection caution

Be sure that the connections to the speakers and the input sources are securely made. If the connections are not secure, the receiver will not operate normally and may produce noise.

Cautions concerning operating and changing connections

After switching on the power, do not attempt to use the controls for a few moments. The output of this unit is large, and, if excessive input is applied, damage to the speakers may result.
For this reason, be sure to decrease the volume before making connections or disconnections of the input terminals.

Reproduction cautions

If unwanted noise such as hum or "howling" occurs while listening to a disc or tape, and the receiver is operating correctly, the noise may be caused by one or more of the following:

1. If the record player is placed directly on or near a speaker, the sound vibration from the speaker may be transmitted, causing "howling."
   Move the record player from the speakers or place a flat cushion under the record player, so that the vibration is not transmitted to the player.
2. Hum might be caused if the shield and center core of the connection wire are connected in reverse, or if the motor is not properly grounded.

TECHNICAL SPECIFICATIONS

AMPLIFIER SECTION

(IHF)

1 kHz continuous power output
both channels driven 230W + 230W (4Ω)
175W + 175W (8Ω)

20 Hz~20 kHz continuous power output
both channels driven 205W + 205W (4Ω)
165W + 165W (8Ω)

Power bandwidth
both channels driven at 8Ω 5 Hz~50 kHz, −3 dB

Total harmonic distortion
0.08% at rated power (20 Hz~20 kHz)
0.015% at half power (1 kHz)

Intermodulation distortion 0.1%

Damping factor 60 (8Ω), 30 (4Ω)

Input sensitivity and impedance
PHONO 1, 2 2.5Vm/25k ,50k, 100kΩ
AUX, TAPE 2 PLAYBACK 200mV/50kΩ
TAPE 1 PLAYBACK, REC/PLAY input 230mV/60kΩ

PHONO maximum input voltage (1 kHz RMS) 250mV

S/N (IHF, A)
PHONO 1, 2 78 dB
AUX 95 dB

Frequency response
PHONO 1, 2 RIAA standard curve ±0.2 dB
AUX 20 Hz~20 kHz, +0 dB, −0.3 dB

Tone controls
BASS 50 Hz, +12 dB~ −12 dB
TREBLE 10 kHz, +10 dB~ −10 dB

Turnover frequency
BASS 250 Hz, 500 Hz
TREBLE 2.5 kHz, 5 kHz

Loudness control (volume at 30 dB) 50 Hz, +10 dB

High filter 7 kHz, −12 dB/oct.

Low filter 30 Hz, −12 dB/oct.

Muting −20 dB

Output voltage
TAPE 1 REC OUT 230mV
TAPE 2 REC OUT 200mV
TAPE 1 REC/PLAY output 30mV

Load impedance
MAIN or REMOTE 4~16Ω
MAIN + REMOTE 8~16Ω

(DIN 45 500)

1 kHz continuous power output
both channels driven 2 × 230W (4Ω)
2 × 175W (8Ω)

20 Hz~20 kHz continuous power output
both channels driven 2 × 205W (4Ω)
2 × 165W (8Ω)

Power bandwidth
both channels driven at 4Ω 5 Hz~40 kHz, −3 dB

Total harmonic distortion
rated power at 40 Hz~16 000 Hz, 4Ω 0.08%

Intermodulation distortion
rated power at 250 Hz:8 000 Hz = 4:1, 4Ω 0.1%

Frequency response 20 Hz~20 kHz, +0 dB, −0.3 dB

S/N
rated power **PHONO 1, 2** 65 dB
AUX 85 dB
50mW power output **PHONO 1, 2** 52 dB
AUX 52 dB

FM TUNER SECTION

(IHF)

Frequency range 88~108 MHz

Antenna terminals 300Ω (balanced)
75Ω (unbalanced)

Sensitivity 1.8μV

Total harmonic distortion
MONO 0.1%
STEREO 0.15%

S/N (HI-LAG)
MONO 85 dB
STEREO 75 dB

Frequency response
CONST 20 Hz~18 kHz, +0.2 dB, −0.8 dB
HI-LAG 20 Hz~15 kHz, +0.2 dB, −0.8 dB

Alternate channel selectivity 80 dB

Capture ratio 1.0 dB

Image rejection at 98 MHz 85 dB

IF rejection at 98 MHz 100 dB

Spurious response rejection at 98 MHz 100 dB

AM suppression 60 dB

Stereo separation
1 kHz 45 dB
10 kHz 38 dB

Leak carrier (HI-LAG) −65 dB

(DIN 45 500)

Sensitivity 1.7μV, S/N 30 dB, 300Ω
1.3μV, S/N 20 dB, 300Ω
1.2μV, S/N 30 dB, 75Ω
0.9μV, S/N 20 dB, 75Ω

Total harmonic distortion
MONO 0.1%
STEREO 0.15%

S/N
MONO 58 dB
STEREO 55 dB

Leak carrier (HI-LAG)
19 kHz −65 dB
38 kHz −75 dB

Limiting point 1.0μV

Bandwidth
IF amplifier 250 kHz
FM demodulator 1000 kHz

AM TUNER SECTION

Frequency range 525~1605 kHz

Sensitivity 30μV, 250μV/m

Selectivity 22 dB

Image rejection at 1 000 kHz 47 dB

IF rejection at 1 000 kHz 40 dB

GENERAL

Power consumption 1100W

Power supply 110V, 120V, 220V, 240V

Dimensions (W × H × D) 550 × 175 × 493mm
$21\frac{21}{32}$" × $6\frac{7}{8}$" × $19\frac{13}{32}$"

Weight 23 kg (50.7 lb.)

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